

fatigued past usefulness? In so doing you defraud your patient; you give her false weight; for underdone labor you receive recompense. An article lately written for some medical journal gives statistics that the number of accidents among skilled workmen is greater when the laborers are fatigued, showing the advisability of periods of rest. You, then, the laborer of the sickroom, are capable of better work following periods of rest.

Does the thought of servitude depress you? Remember the ministering Christ. Was not His whole life one of service? He it was who transformed this lowest form of work into the highest labor. You should not be more sensitive to slights than He. Strive not, then, too eagerly after the ideal. In visionary perfection there is loss of power. Trust yourself; stand upon your own footing; cultivate your own judgment; pattern after no human model, but follow in the footsteps of Him who would "heal the sick—and bind up the broken heart."

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## THE USE OF SCOPOLAMINE IN ANÆSTHESIA

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EVER since the discovery of ether surgeons have been striving to find the ideal anæsthetic, one which will combine the maximum of safety and ease of administration with the minimum of pre- and post-operative dangers and annoyances. But although the discovery of general anæsthesia came over half a century ago, and the period since that time has furnished the greatest advances the medical world has seen, little advancement had been made in the very field that has made so much of our other progress possible, and ether and chloroform, the two general anæsthetics first discovered, are still, in spite of their many disadvantages, supreme in their field. Other methods, such as the sub-arachnoid injection of cocaine, have been tried, but have either been of limited usefulness or have failed altogether. Since 1902, however, several foreign surgeons have been experimenting with scopolamine as an adjuvant to, and in some cases a substitute for, chloroform and ether, and it is the data collected from observation of a series of forty of these cases that furnishes the subject-matter of this paper.

Scopolamine hydrobromate, an alkaloid derived from the *Scopolia Japonica* plant, was first used as a general anæsthetic by Schneiderlin

in 1900. Not a great deal is known about its physiological action except that it is a vaso-dilator, a mydriatic, that it paralyzes the inhibitory action of the pneumogastric, that it induces sleep, and that it is closely related in its action to atropin and hyoscin, the latter having been substituted on one or more occasions. Ophthalmologists have used it locally as a mydriatic for some time. The drug appears in the form of prismatic crystals melting at 59° C. and soluble in water, alcohol, and ether; it degenerates very rapidly when exposed to light or air and should therefore be always used in fresh solution. Experiments have shown that it acts best in combination with morphine, though the exact proportions of the combination which will produce the desired result have not as yet been settled. Until further experiments prove the results of a combination tablet it is best to purchase the drugs separately and combine them at the time of administration. It is administered by hypodermic in any suitable part of the body without relation to the location of the field of operation.

Up to the present writing fourteen hundred and eighty-eight cases of scopolamine anæsthesia have been reported from Germany and Austria, twenty-six from France, and one hundred and fifty-three from this country. Twenty-eight of these latter, reported by Dr. Edward R. Gregg, of Pittsburg, with twelve more recently observed in his clinic, form the basis of our present observations. Of these forty cases, thirty-eight are from the surgical service of Dr. Gregg at the Pittsburg Homœopathic Hospital, and two from the ophthalmological service of Dr. William W. Blair at the same institution, to both of whom I am indebted for permission to observe and report the series. All the cases have come under my personal observation. As several other surgeons are using the drug at the present time, it is probable that by the time this article appears several other series will have been reported.

The data tabulated include the following items: time of administration, operation, amount of chloroform used (if any), presence or absence of a stage of excitement if chloroform was administered, and post-operatively the amount of pain, thirst, and nausea, and the time of vomiting, if vomiting occurred. In all cases the patient received the same dosage, one one-hundredth grain of scopolamine plus one-sixth grain of morphine at each injection, and the patients were not in any sense selected, but were simply those cases which came to operation during the latter part of Dr. Gregg's service without regard to age, sex, condition, or operation. If it is desired to dispense with chloroform, the best time of administration seemed to be two and one-half, one and one-half, and one-half hours before operation.

The dosage and the time of administration having been decided upon, the patient should be taken to a darkened and quiet room and the first hypodermic given. The patient is then told that the operation will not begin for a couple of hours and is advised to sleep if possible. He can then be left alone until the time of the next injection, when he will usually be found sleeping quietly. The introduction of the second needle will probably rouse him partially, but he will not be thoroughly conscious and will at once fall asleep. The face gradually becomes flushed and the pulse full and steady, though it may vary in different individuals from 50 to 120; the respirations are either rapid, shallow, and almost imperceptible, or slow and stertorous, but we were not able to observe any constant relationship between the pulse and respiration rates. The pupils vary from moderate myosis to extreme mydriasis, according to which drug the patient seems the more susceptible to. The third injection may or may not rouse the patient, but he will not be conscious; the physical signs just noted will be intensified.

When the time of operation arrives the eyes should be bandaged and the patient moved to the operating-room as gently and quietly as possible, as noise and motion seem to disturb more readily than pain. For this reason absolute quiet should be maintained during the entire operation. When the skin is incised the patient may show some slight sign of pain, but the more common actions are simply restless movements of the hands and arms, chiefly towards the lower face. The patient's behavior suggests a restless and uncomfortable sleep.

This, however, is the exceptional and ideal case, for should the patient rouse while being transferred or at the incision chloroform or ether, must be administered. The French condemn absolutely the use of ether on the ground that its stimulating effect, following the vasodilatation produced by the scopolamine, would be apt to produce dangerous congestion, particularly in the lungs. This contention, however, is not borne out in the series reported by Seelig, of St. Louis, and Ries, of Chicago, who used ether in all their cases with no bad results. In this series we were able to dispense with other anæsthesia in twenty-five per cent. of the cases.

Should ether or chloroform be necessary, distinct advantages have been gained by the previous administration of the scopolamine-morphine. First, the patient, instead of becoming excited in view of the coming operation, has gone quietly to sleep while awaiting it. In no case did any one of our patients have the slightest recollection of anything that happened after the second hypodermic, even though they

seemed to be semi-conscious while being transferred to the operating-room. This does not include two cases in which it seemed to intensify, or at least had no effect on, an hysterical condition which was present when the first injection was given.

Second, the stage of excitement which so often occurs under ether or chloroform, even in the hands of the most skilled anæsthetist, is in almost all cases absent or so slight as to be harmless. In our experience, however, the drug did not mitigate the severity of such a stage in alcoholics, nor did our colored patients take the chloroform well, all of them struggling violently when it was administered. In eighty-five per cent. of our cases the stage was absent altogether and the other fifteen per cent. were either colored or alcoholic, with the exception of one woman whose after behavior showed her to be extremely hysterical.

Third, the amount of chloroform or ether necessary to induce and to maintain anæsthesia is greatly lessened, the scopolamine seeming to have put the organism in a condition of especial receptivity for the following chloroform or ether.

Considering now the post-operative conditions, those of greatest interest to the nurse, we find the following advantages. First, the pain is greatly alleviated in a large percentage of cases. We have not found, as the French report, that the patient sleeps any longer after the operation, but the pain seems to be dulled or absent entirely in a large majority of cases. This is probably due to the morphia.

Second, nausea, the great bugbear of anæsthesia, is usually slight or absent; very seldom is it as severe as in the ordinary run of simple ether or chloroform anæsthesias. Vomiting, as a rule, is entirely absent, and if present, comes late, when the laryngeal sensibilities are normal and the patient conscious enough to avoid choking. These two facts would demand consideration for the drug were there nothing else to recommend it. Eighty per cent. of our cases were not nauseated at all and eighty-three per cent. did not vomit at all, and of those who did vomit only one vomited within one and one-half hours of the close of the operation. In some cases the vomiting came as late as twelve hours after the operation, and then only once, as if the simple emptying the stomach put an end to what little nausea there was. Only one case showed the slightest tendency to retch. And should the nature of the operation permit, the patient can often be given light diet on the following day.

Third, the drug seems to be a great prophylactic against shock, probably because of the effect of the morphia as well as of any stimu-

lating effect of the scopolamine. The patient may be shocked, of course, and should be watched carefully, but the tendency is not nearly so great, several of our cases undergoing long and tedious plastic operations without the slightest shock following.

Among the unfavorable effects must be mentioned a parching thirst, which follows in some (not by any means all) cases, but which can be alleviated in most cases by allowing all the water craved. If the water causes vomiting, it will usually be a simple emptying of the stomach, which seems to put an instant end to whatever nausea there is and the water can be continued. Occasionally severe headache and troublesome oozing at the field of operation are among the disadvantageous sequelæ, but the former is seldom so severe as to demand especial attention, and the latter has never been excessive or produced any bad result in any of our cases.

When the patient is returned to the ward note should be made of the general condition, as after any anæsthetic, but especially of the condition of the pupils, for when mydriasis is present it shows that morphia is not the predominant drug and the patient may be expected to react more rapidly. Some few patients showed a tendency to slight delirium on awakening, but this was never of long duration nor did it demand any great restraint. If there is marked myosis, slow and stertorous respirations, and a dropped jaw, the patient will need more careful observation. Should shock or syncope demand stimulation it is better to avoid hypodermic medication and to trust to saline infusion, injection, and to heat, as the relationship between scopolamine and the more commonly used stimulants is not as yet thoroughly understood. Should the pupils and respiration indicate that the morphia is the predominant drug and the patient seem to be too profoundly under its influence, the hypodermic injection of atropine and of the saturate solution of permanganate of potash should be considered.

In conclusion, it should be distinctly understood that in the light of our present knowledge scopolamine can make no claim to supersede its tried and proven predecessors in the field of general anæsthesia. What we can say is that it promises to be a valuable adjuvant to ether and chloroform and that in some cases it may take their place, but should it fail to do this in any given case, the patient is yet in a more favorable condition to be put under the influence of ether or chloroform. Much is yet to be learned of scopolamine both in laboratory, in the clinic, and at the bedside, and we must look to those who care for the patient after operation and who are constantly at the bedside for many of the details from which we can draw our conclusions.